



# Use of EPCIS for online temperature monitoring during transport of chilled lamb products

This test was a part of the KMB Competitive Processing project where a new system for online temperature monitoring based on EPCIS was used to monitor temperature during loading, transport and unloading of super-chilled lamb products.

## Objectives

To develop an on-line system for temperature monitoring during the loading, transport and unloading of super-chilled lamb products. The test was conducted by SINTEF Fisheries and Aquaculture and the equipment was supplied by HRAFN.

## Materials and Method

Chilled legs of lamb were used as the test products. The products were sent from Fatland Ølen to a distribution terminal in Trondheim.

9 ambient temperature sensors and 4 sensor probes for product core temperature were placed at point of packaging. The RFID tags with internal and external temperature sensors were inserted in the 4 legs of lamb as shown in the pictures below:

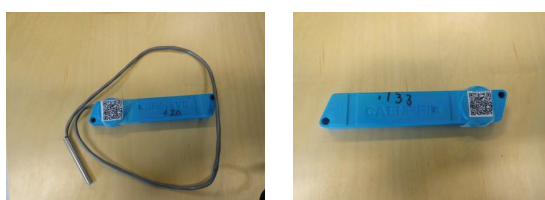


## RFID tags

EPC Gen 2 tags and 2D Barcodes were used.

## Sensors

The RFID based temperature sensors were used. This included tags with internal and external sensor and tags with only internal sensors as shown in the pictures below:



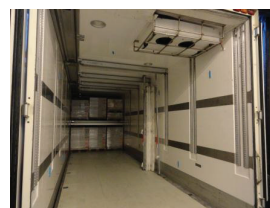
## Antennas and Communication unit

RFID and GPS antennas and a GSM based communication unit were used to read the temperature data and transmit it online to the EPCIS based online temperature monitoring system. The RFID antenna and communication unit is shown below:



## Set Up

The final setup of temperature sensors in the truck and the product is shown below. In total, 13 sensors were used - 4 (with internal and external temperature sensors) were inserted in 4 legs of lamb product - two of which were 2 cm inside the product and the other two just under the surface (1-2 mm inside the product). The other 9 tags with internal temperature sensors were fixed inside the truck (4 in each side wall and 1 in the ceiling). This setup is shown in the pictures below:



## Results

### Preliminary tests

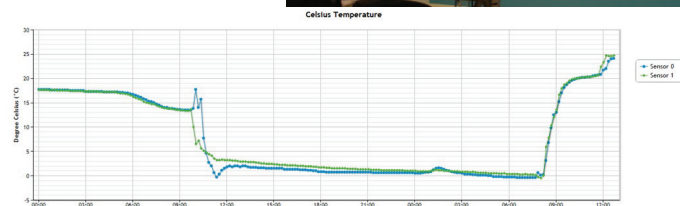
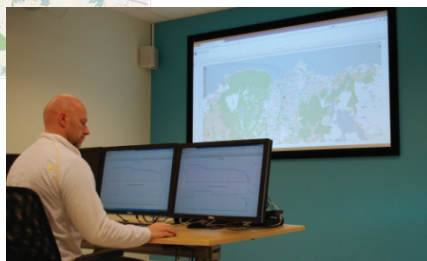
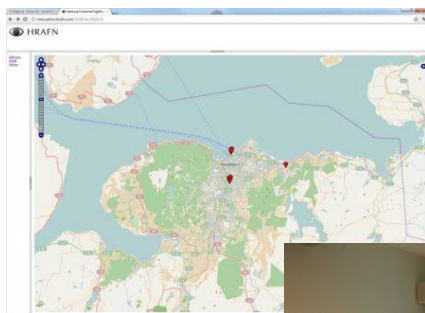
Preliminary test where made in cooperation with HRAFN, the suppliers of sensors, antennas and communication unit.

### Final Test during Transport of lamb legs from Ølen to Trondheim

The final test was conducted on 23rd November during the transport of lamb legs from Fatland, Ølen to the distribution terminal in Trondheim. The equipment was setup as described above and the truck left the Fatland facility at 12:30, arriving in Trondheim at 3:00 on 24th November. The equipment was retrieved from the truck at 7:00 and brought to the lab at SINTEF Fisheries and Aquaculture.

### EPCIS - Web based monitoring

The Web-based monitoring system provided by HRAFN was used for online temperature monitoring. The RFID based temperature sensors communicated with the main unit and transmitted the data to an EPCIS based system for temperature monitoring connected to event types.



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### EPCIS temperature events

An EPCIS event was created when temperature was read every 10 minutes and linked to each uniquely identified tag. An example of an EPCIS-temperature event is shown below:

eventid	26234
epc	urn:epc:id:giai:0000000.121
eventTime	23. nov 2011 12:21
readPoint	urn:hrafn:readpoint:licenceplate:SINTEF
bizLocation	urn:hrafn:readpoint:licenceplate:SINTEF
BizStep	urn:hrafn:temperature:bizstep:temptracking
disposition	urn:epcglobal:cbv:disposition:in_transit
Temp1	0,3
Temp2	

### Data transmission

Only 3 of the 13 tags that were placed in the truck and the product transmitted the data online during the transport. The GPS functionality of the equipment did not work throughout the entire transportation period.

### Data Retrieval

Once the equipment and the sensors were removed from the truck at the distribution terminal in Trondheim, the equipment was set-up again at the SeaLab SSO\* to retrieve all the temperature data. All sensors were programmed to record temperature every 10 minutes during transportation. The picture below shows the setup at the SeaLab SSO\*.



\* SINTEF SeaLab Surveillance Simulation and Operation

**Lønnsom foredling: Norges største forskningsrådsprosjekt innen foredling av næringsmidler. Et 5-årig blå-grønt prosjekt med 16 ulike partnere og forskningsenheter.**

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